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EXAMINER	
KRASNIC, BERNARD	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/697,362	LIN ET AL.	
	Examiner	Art Unit	
	Bernard Krasnic	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-12 and 14-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-4 and 14-16* is/are rejected.

7)☒ Claim(s) *5-12 and 17-24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. The amendment filed 2/21/2007 have been entered and made of record.

2. Applicant has canceled claims 1 and 13.

3. In response to the amendments filed on 2/21/2007:

The Applicant has not addressed all the Claim Objections which were submitted by the Examiner in the original Non-Final Office Action filed on 11/20/2006 and therefore the Examiner will address them below.

The "Rejections Under 35 U.S.C. 112" have been entered for the most part and therefore the Examiner withdrawals most of the 35 U.S.C. 112, Second Paragraph Rejections. The 35 U.S.C. 112, second paragraph rejections that were not addressed by the Applicant will be addressed below.

4. Applicant's arguments with respect to claims 2-12 and 14-24 have been considered but are moot in view of the new ground(s) of rejection necessitated by the Applicant's amendments toward independent claims 3 and 15.

The Applicant alleges, "It is suggested that May et al disclose the step of ..." in page 19, and states respectively that May et al does not teach the 1D or 2D local variances as disclosed in the amended independent claims 3 and 15. However the Examiner firstly disagrees, and does believe that May discloses a 2-D variance when

stating and mentioning the "frame-based variance" because a frame is 2 dimensional and therefore when a variance of a 2 dimensional frame is computed, it is considered to be 2 dimensional as well. In regards that May does not teach the 1D local variance, the Examiner agrees and that is why the Examiner had used Avinash in the 35 U.S.C. 103 rejection of the original Non-Final Office Action to reject that limitation in the original claims 3 and 15. Therefore, the Examiner has used and incorporated the Avinash (US 6,757,442 B1) reference as necessitated by the Applicant's amendment with the May reference to provide a 35 U.S.C. 103 rejection as will be discussed below.

5. Applicant's arguments filed 2/21/2007 have been fully considered but they are not persuasive.

The Applicant alleges, "Claims 3-5 and 15-17 are included ..." in page 20, and states respectively that Avinash does not disclose the 2D local variance. The Examiner agrees but believes the Applicant has misunderstood the rejection. It was initially stated in page 7 of the Examiners original Non-Final Office Action, the paragraphs stating "May discloses selecting a window ..." and "However, May fails to disclose ...", that May discloses and teaches the 2D local variance limitation but May fails to disclose or teach the 1D local variance along multiple directions limitation. It was then further the intent of the Examiner to use Avinash in page 8 of the Examiners original Non-Final Office Action to disclose and teach the 1D local variance along multiple directions limitation which May failed to disclose or teach; the Examiner suggested the "(see Fig. 11 and 12, col. 10, lines 63-67)" in page 8 of the Examiners original Non-Final Office Action to teach the

1D local variance along multiple directions which May failed to disclose and not the 2D local variance limitation which was taught by May.

The Applicant alleges, "It is further suggested that Vanish discloses ..." in page 20, and states respectively that "there is no indication as to how a pixel kernels relate to a structural pixel or a given pixel". However the Examiner disagrees because the passage "(see Fig. 11 and 12, col. 10, lines 63-67)" specifically states that the "orientation smoothing begins with assigning directional indices to each pixel identified as a structural pixel" and that "within a local neighborhood surrounding each structural pixel, statistical variances in four directions are computed". The kernel is believed to be the directional indices.

The Applicant alleges, "It is also suggested that Vanish ..." in pages 20-21, and states respectively that there is no indication that the selection of the direction of the smallest 1D local variance has anything to do with local edge direction. However the Examiner disagrees because when the direction of minimum 1D variance is selected from the four computed multiple directional variances and using this information an orientation smoothing begins. This orientation smoothing which shows that an edge is smoothed dependent upon the orientation or the local direction (see Avinash col. 10, lines 59-67), and the selection of the minimum variance between the local four computed multiple direction 1D variances gives rise to the "detection of the local edge direction by selecting one of the direction with the smallest 1D local variance" limitation.

The Applicant alleges, "It is further suggested that Vanish discloses ..." in page 21, and states respectively that Avinash doesn't disclose the 2D local variance squared

quantity and the 1D local variance squared quantity and doesn't disclose the directions L3 and L4. However the Examiner disagrees firstly because May discloses the 2D local variance as discussed above. The Examiner disagrees secondly because Avinash discloses a 1D local variance [the four multiple directional local variances] as discussed above and the squared quantity is just a way to symbolize variance which is typical mathematical representation for the variance value. The Examiner disagrees thirdly because Avinash does disclose the directions L3 and L4 [see col. 11, lines 4-6] where Avinash discloses that the four multiple directional 1D local variances [the variance along one direction is considered to be 1 dimensional] are assigned based on the directions of 45 degrees [same as Applicants L4], 135 degrees [same as Applicants L3], 90 degrees [same as Applicants L2], and 0 degrees [same as Applicants L1].

The Applicant alleges, "Vanish is said to disclose selecting the detected local direction L ..." in page 21, and states respectively that there is no reference to a local edge direction L and no indication that this quantity L is used in a local filter. However the Examiner disagrees because as discussed above, the orientation smoothing shows that an edge is smoothed dependent upon the orientation or the local direction which is selected as the smallest variance from the computed local four multiple direction 1D variances; smoothing could only be accomplished with filtering.

The Applicant alleges, "It is suggested that Vanish discloses ..." in page 21, and states respectively that Avinash doesn't disclose the 1D filter strength and that May doesn't disclose the 2D filter strengths and that May in view of Avinash doesn't disclose a combination of creating a directional local filter for the detected local edge direction L

based on the 1D and 2D filter strengths. The Examiner agrees in that the combination doesn't specifically teach a combination of creating a directional local filter for the detected local edge direction L based on the 1D and 2D filter strengths and therefore has removed the rejection upon claims 5 and 17 and has just objected to claims 5 and 17 as will be discussed below.

The Applicant alleges, "This brings us full circle to the cited combination ..." in page 22, and states respectively that there in no motivation to combine May with Avinash. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, as stated in the Examiners original Non-Final Office Action, Avinash discloses the motivation [see col. 1, lines 8-14], where a more sophisticated adaptable filter may be used to enhance the appearance of digital images, such as medical diagnostic images, to more clearly render certain image features while maintaining overall image intensity levels. Both May and Avinash deal with removing artifacts using filtering based on local variance computation.

The Applicant alleges, "Claims 6, 9-11, and ..." in page 22, and states respectively that amended independent claims 3 and 15 are now allowable. However,

the Examiner disagrees because as stated in the discussions above, and below in the rejections sections, claims 2-4 and 14-16 are still not allowable subject matter.

Claim Objections

6. Claims 2, 5, and 16 are objected to because of the following informalities:

Claim 2, line 3: "estimating the global" should be -- estimating a global --.

Claim 5, line 7: "the 1-D filter" should be -- a 1-D filter --.

Claim 5, line 9: "computing the 2-D filter" should be -- computing a 2-D filter --.

Claim 16, line 9: "along the horizontal" should be -- along horizontal --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 6, and 21-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re Claims 6, lines 7 and 8: The limitations "σ" *and* "σ_k" renders this claim indefinite because it is unclear what these symbols actually represent, there is no descriptive statement for them. It is suggested to describe briefly the meaning for these two representative symbols within the claim.

Re Claim 21, line 5: The limitation "the mid range" is insufficient antecedent basis. It is suggested to be -- the mid value -- as mentioned in line 3 of claim 21.

Claims 22 and 23 are dependent upon claim 21.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 2-4 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over May et al (US 5,844,627) in view of Avinash (US 6,757,442 B1).

Re Claim 3: May discloses a method for reducing noise / noise reduction in a digital image formed from a plurality of pixels / plurality of windows or neighborhoods including a given pixel / center of window or neighborhood, the method comprising the steps of computing global statistics / global noise variance (see 203, Fig. 2, col. 3, lines 23-25) from the image; computing local statistics / neighborhood mean and variance / frame mean and variance (see 201a, Fig. 2, col. 2, lines 66-67) for the given pixel; configuring a local filter using the local and global statistics (see 204, Fig. 2, col. 3, lines 49-54, 64);

filtering the given pixel using the local filter to reduce image noise (see col. 3, lines 49-54, 64); wherein the step of computing the local statistics for the given pixel further includes the steps of selecting a window / neighborhood (see col. 3, lines 3-5) containing the given pixel and a plurality of neighboring pixels; computing a 2-D local variance / frame variance (see 201a, Fig. 2, col. 2, lines 66-67, the variance of a 2D frame is therefore 2D) of the given pixel based on information related to the pixels in the window;

However, May fails to disclose or fairly suggest computing a plurality of 1-D local variances along multiple directions through the given pixel in the window; and detecting a local edge direction by selecting one of the direction with the smallest 1-D local variance.

Avinash discloses computing a plurality of 1-D local variances along multiple directions through the given pixel in the window (see Figs. 11 and 12, col. 10, lines 35-67); and detecting a local edge direction by selecting one of the direction with the smallest 1-D local variance (see Fig. 12, col. 10, lines 35-67, col. 11, lines 1-3, col. 13, lines 55-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify May's method using Avinash's teachings by including respectively the procedure of using the directional filter to provide a more sophisticated adaptable filter in order to enhance the appearance of digital images, such as medical diagnostic images, to more clearly render certain image features while maintaining overall image intensity levels (see Avinash, col. 1, lines 8-14).

As to claim 15, the claim is the corresponding system claim to claim 3. The discussions are addressed with regard to claim 3.

Re Claim 2: May further discloses estimating the global noise standard deviation σ (see 203, Fig. 2, col. 3, lines 23-25, note that the square root of the global noise variance is equal to the global noise standard deviation) to generate the global statistics.

As to claim 14, the discussions are addressed with respect to claim 2.

Re Claim 4: Avinash further discloses selecting a window containing the given pixel and a plurality of neighboring pixels (this limitation is taught by May as discussed in claims 3 and 15 above); computing the 2-D local variances σ_0^2 of the given pixel based on information related to the pixels in the window (this limitation is taught by May as discussed in claims 3 and 15 above); computing the 1-D local variances σ_1^2, σ_2^2, σ_3^2, *and* σ_4^2 along the horizontal (L1), vertical (L2), diagonal from upper left to lower right (L3), and diagonal from upper right to lower left (L4) directions through the given pixel, respectively, in the window (see Fig. 11-12, col. 10, lines 35-67, L1 is the corresponding 0 degree direction indices, L2 is the corresponding 90 degree direction indices, L3 is the corresponding 135 degree direction indices, L4 is the corresponding 45 degree direction indices); and detecting the local edge direction by selecting the

direction with the smallest 1-D local variance (see Fig. 12, col. 10, lines 35-67, col. 11, lines 1-3, col. 13, lines 55-58).

As to claim 16, the discussions are addressed with respect to claim 4.

Allowable Subject Matter

11. Claims 6, and 21-22 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

12. Claims 5, 7, 9-10, 12, 17-19, and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 8 is dependent upon claim 7, and therefore is objected to.

Claim 11 is dependent upon claim 10, and therefore is objected to.

Claim 20 is dependent upon claim 19, and therefore is objected to.

Claim 23 is dependent upon claim 22, and therefore is objected to.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fang et al discloses an adaptive edge-preserving smoothing filter; Adelson et al discloses a noise reduction system.

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard Krasnic whose telephone number is (571) 270-1357. The examiner can normally be reached on Mon-Thur 8:00am-4:00pm and every other Friday 8:00am-3:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Bernard Krasnic
April 30, 2007

JINGGE WU
SUPERVISORY PATENT EXAMINER